

# MISSOURI

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## resources

Winter 2013 • Volume 30 • Number 1



Missouri  Resources  
30 YEARS

# director's comment



**W**ater quantity, quality and availability affect the well-being of all Missouri citizens. When water quality is good and the supply is plentiful, these critical factors are often taken for granted. But when good water becomes a scarce commodity and people must compete for the available supply, the importance of these factors increases in a dramatic way.

Missouri is an ecologically diverse state blessed with rich farmland and an abundance of water. In recent years, however, we have seen certain areas of the state face water supply challenges not unlike those seen in the late 1980s and 1990s. The 2012 drought brought into sharp focus the importance of this crucial resource

and exposed a number of vulnerabilities for which we must once again plan. From protecting water quality to ensuring safe drinking water, to providing assistance for Mis-

souri's working farms and communities, the Department of Natural Resources engages in a multitude of efforts to protect and enhance our state's most precious natural resources. One such example was the department's recent efforts in implementing Executive Order 12-08, which authorized the emergency Drought Cost-Share Assistance Program. This program offered practices for livestock producers and farmers to drill or deepen wells or expand irrigation systems during the summer of 2012. Approved projects had to meet specific criteria, provide an immediate material benefit to crops or livestock and not adversely affect a public water supply.

In order to review, assess and process more than 11,000 applica-

tions, it was imperative to establish an efficient and operational plan of action as expeditiously as possible. The department, along with the Missouri Department of Agriculture, spearheaded the effort to start up the program, but it was the combined efforts of MoDNR, MDA, 114 local soil and water districts and other state and federal agencies all working together that was necessary to fully implement the drought relief efforts.

In fact, nearly 700, or half, of the department's entire staff worked more than 40,000 hours from when the program was announced on July 23, through Nov. 30 – and the work continues.

The Missouri Department of Natural Resources and its staff continue to demonstrate their dedication and true passion for protecting public health and our natural resources for all Missourians.

Sara Parker Pauley  
Missouri Department of Natural Resources

## MISSOURIresources

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### Mission Statement

The mission of the Missouri Department of Natural Resources is to protect, preserve and enhance Missouri's natural, cultural and energy resources.

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## 2 160

### **Missouri Geological Survey – Earth science since 1853**

*by Joe Gillman*

*In geologic time, 160 years is a mere blink of an eye. In service to Missouri citizens, it's almost two lifetimes.*

## 8 Moo Juice

### **Turning waste into watts**

*by Ming Xu*

*Anaerobic digesters are converting onsite-produced waste from concentrated animal feeding operations into electrical power. In some cases, excess power is sold back to the local utility. Re-volting? Yes, you could say that.*

departments

**14 News Briefs** **20 Resources to Explore** **25 One Last Word**

**Above:** Jefferson Barracks National Cemetery in St. Louis County contains more than 158,000 military interments from U.S. wars.

**Front Cover:** Omar Reed from Muskogee, Okla. was one of several Civil War re-enactors at the grand opening of the Battle of Island Mound State Historic Site near Butler.

**Back Cover:** Huzzah Creek pours over the spillway at Dillard Mill State Historic Site near Davisville.

*DNR photos by Scott Myers.*



DNR photo by Scott Myers

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## *Missouri Geological Survey—Earth science since 1853*

by Joe Gillman

**O**ne hundred sixty years is not a very long time when speaking in geologic terms. However, the Missouri Department of Natural Resources' Geological Survey, which was established Feb. 24, 1853, will observe that noteworthy milestone this year.

Since that time, the Missouri Geological Survey has provided reliable scientific information to describe and understand Missouri's wealth of natural resources. This publicly available scientific information about the characteristics of the state's geology is essential for informed decision making, environmental protection and economic development that enhance and protect our quality of life. The Missouri General Assembly recognized





that geologists could provide valuable information about Missouri's land, mineral and water resources.

As a result, in 1853, the Geological Survey was created as the first state agency commissioned to study the natural resources with the mandate of making a "... thorough geological and mineralogical survey of this state," and "... to discover all beds or deposits of ore, coal, marls and such other mineral substances and mineral waters as may be useful or valuable."

Gov. Sterling Price appointed George C. Swallow as the first director of the survey and state geologist. Swallow and his staff were given the daunting task of establishing a thorough analysis of Missouri's geologic resources. Much of this work was accomplished by travel on foot, boat and train, with crude instruments and little information from which to work. The job was tedious and difficult, but these scientists slowly began to unravel Missouri's diverse and complex geologic characteristics.

## Why is a Geological Survey Important?

Missouri was six months shy of its 32nd birthday when the survey was established. Early pioneers and settlers had staked their claims in the forested hills and along the abundant river ways to carve out a life from

the land. The charge to conduct a statewide geological survey was an effort to stimulate Missouri's fledgling economy. In 1855, in his first report to the General Assembly, Swallow commented that the work of the survey would advance the knowledge of the state's

mineral and water resources and would invite capital and secure profitable business operations.

During these early years, geologists focused their attention on evaluating Missouri's iron, lead and coal deposits. These critical resources were the materials on which an industrialized economy would be based – and they were expensive and difficult to import. They also evaluated Missouri's potential for water power in its springs and rivers, conducted a general analysis of soils to determine their potential for agriculture, and developed a basic geologic framework that is still important today.

## Indispensable Role in Society

Missouri has changed considerably since George Swallow and his staff of geologists embarked on the initial efforts to characterize Missouri's geologic resources. What has not changed is the need to collect, analyze and apply geologic data to solve real world problems. The continued emergence of complex challenges and the need to address environmental, natural resource, technological and health issues will continue to foster the need for sound earth science information and accessibility.

The American Institute of Professional

*(continued on page 6)*



DNR photo by Hylan Beydler

**(Opposite page)** Current Missouri Geological Survey staff sit for a photo at the historic Rolla building. Home to the Missouri Geological Survey from 1904 until 1946, the building presently houses Missouri University of Science and Technology's Mathematics and Statistics department.

**(Top)** Henry A. Buehler (wearing fedora) and staff. Chief Buehler served as state geologist from 1909 until his passing in 1944. Two buildings in Rolla are named in his honor, including the present home of the survey and a park adjacent to the facility.

**(Bottom)** Jack and Angie Dewey, Fishers, Ind.; Marcia New, Rolla and Emma Dewey, Fishers, examine rock samples at the Edward L. Clark Museum of Geology in Rolla.

# Service to Missourians

DNR photo by Mark Gordon



Geologist Edie Starbuck uses a laptop and GPS as she collects geologic data in the field. To create a geologic map, staff map makers will attempt to collect at least 11 data points per square mile, or about 660 data points per map. They walk 50 to 100 miles collecting data during a typical field season.

cal Survey welcomed other scientific and educational organizations including: the U.S. Bureau of Mines in 1920, the U.S. Geological Survey in 1921 and the U.S. Forest Service in 1938.

## State Water Plan, Groundwater, Well Construction and Drought Assistance

In the 1930s, the survey completed the first state water plan and began developing well construction standards. The 1940s saw the survey begin efforts to establish a statewide groundwater monitoring network. Today the survey continues to provide communities and homeowners with information about groundwater resources and the safe construction of wells that provide clean drinking water to Missouri families. During emergency relief efforts of the historic drought of 2012, staff geologists responded to more than 3,500 requests for information and assistance about water supplies and well construction.

## Educational Outreach

The Missouri Geological Survey has a robust educational outreach program through which staff inform the public by presenting exhibits and lectures, conducting workshops, and leading field trips. The Edward L. Clark Museum of Missouri Geology enables staff to offer teachers, students and the general public the opportunity to learn about Missouri geology, the importance of protecting our natural resources and the history of the survey.

One of the first public service entities to reside in Rolla, the Missouri Geological



(Above and opposite page) Medals won by the Missouri Survey include a bronze medal at the 1892-1893 Columbian Exposition for a report on coal deposits in Missouri, and a gold medal at the 1904 St. Louis World's Fair for a series of reports describing the geology, paleontology, and mineral and water resources of the state. DGLS medals photos by Scott Myers/DNR

## Assessing Missouri's Mineral-Rich Areas

During the 1950s, survey geologists worked extensively to conduct geologic assessments of mineral-rich areas of southeast Missouri, facilitating the discovery and development of massive iron deposits. In the 1960s, the geologic core repository was established allowing the survey to collect and archive drill samples from across the state which are available to the public. Today's division scientists are working to understand the origins and geologic characteristics of rare earth elements and critical minerals in southeast Missouri. These elements provide crucial components in green technologies and efficient, clean power sources.



## Emergency Relief Efforts Following the Joplin Tornado

When the devastating tornadoes struck southwest Missouri in spring 2011, division geologists responded to assist emergency managers and communities with assistance in waste management decisions. The region had been devastated and needed help developing waste management strategies that would expedite the cleanup and protect groundwater and the environment from further degradation due to temporary waste storage locations.



Staff tour an oil field in Vernon County where horizontal wells, owned and operated by Palo Petroleum Inc., are producing oil.



DNR photo by Hylan Beydler







DNR photo by Sherri Stoner

**Division of Geology and Land Survey staff introduce environmentally safe dye into a sinkhole. Dye tracing is used to study the movement of groundwater.**

Geologists recently concluded, “The state geological surveys serve our country in a significant role by providing unbiased and sound scientific research, geologic data and maps, and reports to the public, industry, academia, government agencies, as well as local, municipal, county, state, and federal legislators and regulators.”

“Today, the Missouri Geological Survey continues to play a crucial role in society for the state and our nation. The demands for energy, mineral and water resources continue to grow,” said Carey Bridges, program director for the Missouri Geological Survey. As it did 160 years ago, the survey continues to collect, analyze, distribute and archive information about our state’s natural resources.

Decision makers still must integrate economic benefit and environmental considerations. The demand for more detailed and more accurate geologic data grows as we refine our understanding of Missouri’s hidden wealth.

These new data help find new uses for our resources and implement strategies to protect our environment while mitigating documented geologic hazards.

“For more than 130 years, the U.S. Geological Survey has been working in partnership with organizations such as the Missouri Geological Survey to provide science information that is vitally important to the U.S. economy, the safety and health of American citizens, and the sustainability and security of the country’s natural resources,” said Marcia McNutt, Ph.D., USGS Director.

Society demands resources to meet its needs. Limestone resources are critical for pollution control technologies, agriculture and building materials. Cell phones, computers and flat screen TVs require metals such as gold, silver, copper, lead and platinum. Advancing technology in the areas of nanoelectronics, magnetics, energy efficiency and metallurgy all rely on elements with unique properties like neodymium, gadolinium, dysprosium and samarium. A thorough understanding of the state’s geology helps drive decisions related to these resources and their potential use.

Advanced technology also has provided new tools for evaluating the earth’s natural resources. High-resolution imagery, subsurface geophysics and GIS capabilities allow scientists to look at the earth in ways not possible a decade ago.

Today, Missouri is a leader in minerals production, agriculture and natural resource protection. Services that the state geological survey provide are essential to public health and safety and the sustainability of our natural resources and economy.

“This important anniversary is a fitting time to recognize the critical and distinct role of the Missouri Survey in helping meet the growing challenges society faces in its





DNR photo by Mark Gordon

interaction with a natural world undergoing change from both natural and man-made causes,” McNutt said.

Society’s demand for information in areas of energy, minerals, hazards, climate variability and human health requires improved scientific knowledge to meet 21st century challenges.

As the Missouri Geological Survey begins its next 160 years, it continues to provide critical expertise for important envi-

ronmental and natural resource issues. Visit the Department of Natural Resources’ Division of Geology and Land Survey at 111 Fairgrounds Road in Rolla. Learn more at [dnr.mo.gov/geology/](http://dnr.mo.gov/geology/). ☀

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*Joe Gillman is the 19th state geologist for Missouri and is director of the Department of Natural Resources’ Geology and Land Survey division, home to the Missouri Geological Survey.*

**(Top) Geologist Cheryl Seeger (left) and U.S. Geological Survey scientists from Washington D.C. and Denver, Colo. inspect and evaluate rock core from the McCracken Rock Core Library and Research Center. The Rolla facility is home to more than 2.5 million linear feet of exploration rock cores.**

**(Bottom) Geologist Brad Mitchell assists farmers and well drillers seeking to drill water wells during the severe drought of 2012.**



DNR photo by Mark Gordon



## Turning waste into watts

by Ming Xu

**A**s the old saying goes, one man's trash is another man's treasure. At Hampton Feedlot in Chariton County, they go by a slightly different philosophical motto – one cow's waste is another man's electricity.

A custom beef cattle feeding operation, Hampton Feedlot is converting manure from 2,400 cows to green power and natural fertilizers. The entire process is done onsite.

### The Science

Classified as a concentrated animal feeding operation, or CAFO, Hampton Feedlot holds approximately 4,000 beef cattle in 30 open-feed pens and four confinement areas. Using six 30,000-gallon anaerobic digesters, the feedlot has been able to process more than 24,000 gallons of manure waste daily into about 85,000 cubic feet of biogas. Biogas consists of 55 to 70 percent

methane, a primary component of natural gas, along with carbon dioxide and other components. That biogas is fed to a 300-kilowatt engine to generate electricity.

The process generates enough electricity to power the feedlot. Additional power from this renewable energy source is then sold to a local utility.

The process is innovative and a first for Missouri. Hampton Feedlot is the state's first electricity-generating on-farm anaerobic digester. But the technology is not new. In fact, this process has been widely used for hundreds of years in Germany and Sweden for power and heating. In rural areas of developing countries like India and China, it is used for cooking and household heating.

"To understand anaerobic digestion, we have to harken back to our middle school science class," said Jimmy Daniels, project manager with Hampton Feedlot. "Anaerobic





Hampton Feedlot Inc. photo

(Opposite page) Manure from beef cattle in the confinement barns at Hampton Feedlot in Triplett, Mo., is collected in deep pits with agitators at the end of each barn. The waste is then sent to anaerobic digesters where it is converted to biogas.

(Top) Hampton Feedlot holds approximately 4,000 beef cattle in 30 open feed pens and four confinement barns. The floors are slatted and built directly over the manure pits.

(Bottom) Hampton Feedlot employee Tony Winkler performs a digester system safety check.

simply means no air, or more specifically, no oxygen. Without the presence of air or oxygen in the digester reactor, bacteria can break down, or ‘digest,’ organic material like livestock manure, food-processing waste or wastewater, into biogas. After some cleanup, biogas can be used to produce heat in boilers or electricity in engines or turbine generators, like our project,” said Daniels.

## The History

Hampton Feedlot’s anaerobic digester project has taken nearly five years to become a reality.

“We at Hampton have a deeper understanding of the phrase, ‘Rome wasn’t built in a day,’” Daniels said. “It’s been a long journey, filled with financial and technical bumps along the way.”

Hampton’s board of directors started researching this cutting-edge technology almost five years ago when they were seeking to divert the abundant amount of manure waste produced in a single day, which averaged more than 300,000 pounds. They enlisted Rolla-based Missouri Enterprise to



DNR photos by Scott Myers



**Hampton Feedlot employees Tony Winkler (left) and Jimmy Daniels (right) visit with DNR Division of Energy staff during a monitoring visit in September, 2012.**

**(Opposite page, top) Six 30,000-gallon anaerobic digesters are capable of treating more than 24,000 gallons of manure daily – enough to power a 300-kw engine generator. Meanwhile, it achieves the benefits of odor control, pathogens reduction and nutrient management improvement.**

**(Opposite page, bottom) Winkler, the digester manager, looks into the tank through a monitoring window to assess the anaerobic fermentation in the digester.**

complete a comprehensive feasibility study in late 2009, and the results looked promising. The Hampton team toured a number of dairy farm digesters in northern states to obtain information on different digester technologies before proceeding with their own project.

With a total project cost of more than \$4 million, financing posed a significant challenge from the beginning.

“Although local lenders supported the idea of renewable energy projects, they hesitated to loan us money,” Daniels said. “We really had to work hard to erase their concerns, addressing the various risks and uncertainties ... Even so, without the financial assistance from both federal and state governments, this project would not have become a reality.”

In summer 2010, the project was awarded a \$450,000 grant from the Energize Missouri Renewable Energy Biogas program, funded by the American Recovery and Reinvestment Act of 2009 and administered

by the Missouri Department of Natural Resources’ Division of Energy. The same program also funded the landfill gas-to-electricity project at the City of St. Joseph’s sanitary landfill, developed by Kansas City Power and Light Company-Greater Missouri Operations.

That project has been fully operational since March 2012, and annually provides green power to nearly 1,000 homes. Hampton also was able to secure an 80 percent guaranteed loan from the U.S. Department of Agriculture. In addition, the project was eligible for the U.S. Department of Treasury’s Renewable Energy Tax Credit, which covers up to 30 percent of the total eligible project cost.

They broke ground in 2011, but the challenges did not end there. More than 95 percent of all 191 farm digester systems in the United States have been installed on either dairy or swine farms. Before Hampton, only two biogas projects existed on beef farms, one each in Florida and Iowa.



“The difference between dairy cows and beef cattle is, among other things, the rate at which the waste is produced,” said Terry Smith, consultant and construction manager at Hampton Feedlot. “This brought about distinct design specifications and requirements. We had to work closely with Andigen LLC, our digester system developer, to design and engineer reactor tanks with auxiliary equipment custom to our farm.”

The system Andigen designed had many benefits, including a higher manure destruction rate. It also was the first time it had been applied to a beef cattle farm.

“It was a learning experience for everyone,” said Smith.

## The Benefits

Since it began operation in fall 2012, Hampton has enjoyed the offset of its own energy costs and an increase in revenue through the sale of electricity. But that’s not the only financial benefit expected. Hampton currently is producing approximately five tons of digested solids daily and selling it after a water-separation process. Hampton also is adding a drying system to produce natural fertilizer. The dryer was scheduled to be operational by the end of 2012.

“By using waste heat from the engine generator, a unique combined heat-and-power process will be employed to reduce moisture levels of the solids ... and kill remaining pathogens,” Daniels said. “What we eventually get is an incredible, environmentally friendly fertilizer with no waste.”



DNR photo by Scott Myers



DNR photo by Scott Myers



In Midwestern states like Missouri, where electricity rates are relatively low, the primary benefits for farm digester projects may be as much environmental as they are economic.

Digesting half of a farm's waste stream significantly reduces deposits into lagoons, thereby decreasing the potential for run-off into the soil and nearby watersheds. Employing digesters also significantly reduces odor and the amount of carbon dioxide released into the atmosphere. It is estimated that this particular project has achieved an annual reduction of 1,000 equivalent tons of CO<sub>2</sub>.

## The Future

Hampton Feedlot continues to improve its digester system's performance and reliability and is looking at converting diesel-fueled farm equipment to electric, adding other organic waste – like corn silage or

**The mechanical manure separator separates the digested waste into solid and liquid fractions. The separated solids can be used for animal bedding or soil amendment. The separated liquids can be pumped through an irrigation nozzle for field spreading.**



food waste – to co-digest with the manure to increase biogas production. The company also has plans to add a second engine generator to their operation.

“We are eager to tell people about this project,” Daniels said. “We’d like to share every single piece of our knowledge and experience. Lessons learned from our project will definitely benefit the future application of CAFO biogas projects in Missouri. There’s so much potential.”

Indeed, the potential does exist in the Show-Me State. As one of the top five hog-producing states in the nation, Missouri is home to 200 swine operations. These farms are capable of producing roughly 2.7 billion cubic feet of biogas and could generate 177,000 megawatt hours of electricity annually. That’s enough to power nearly 16,000 homes for one year.

“Hopefully, we at Hampton can establish a successful example, and more exciting biogas projects at CAFOs and wastewater treatment facilities will follow,” Smith said. 🌞

*Ming Xu is an energy specialist with the department’s Division of Energy. He manages the biogas program.*

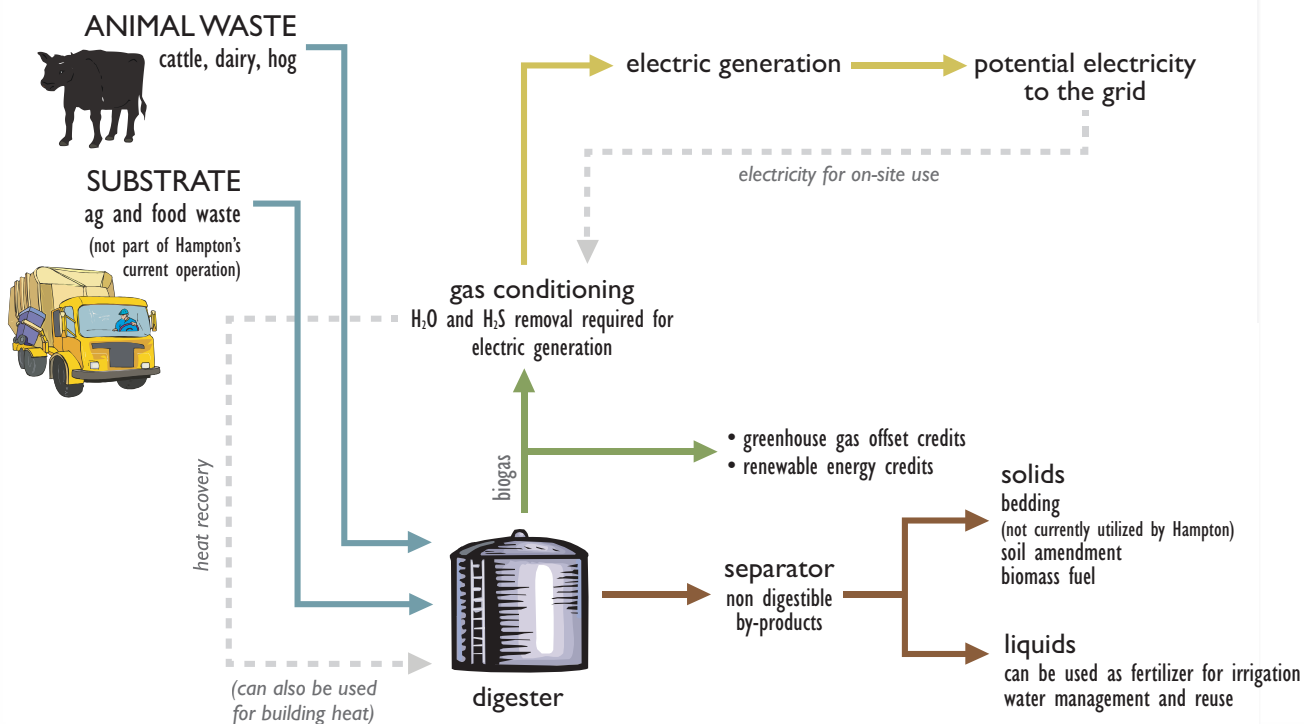


DNR photos by Scott Myers

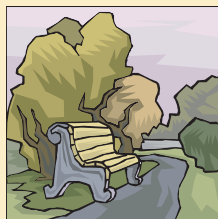
(Above) The solid material generated from the digesters can be used “as is” for animal bedding, or composted for use in horticultural applications. Hampton Feedlot has purchased a dryer to further convert the waste into a marketable organic fertilizer.

(Opposite page, top) Division of Energy employee and story author Ming Xu examines a 300-kw Martin Machinery biogas generator. It produces sufficient electricity for onsite use and excess power can be sold to a local utility. The waste heat from the engine is recovered and used to pre-heat manure before it is sent to the digesters.

## Typical Anaerobic Animal Waste Digester



## Federal Grants Awarded for Missouri Trails



The Missouri Department of Natural Resources announced that 15 trail projects in Missouri received approximately

\$1.37 million in funding through the federal Recreational Trails Program.

The Recreational Trails Program is a federally funded grant program for trail-related land acquisition, development or restoration. In Missouri, Recreational Trails Program funds are administered by the department in cooperation with the Federal Highway Administration.

The 15 grant recipients were chosen from 24 applications and were selected based on recommendations from the Missouri Trails Advisory Board, which represents diverse trail interest groups. The grants were awarded based on the results of a competitive scoring process and the application's suitability under funding provisions included in the Safe, Accountable, Flexible, Efficient, Transportation Equity Act: A Legacy for Users. At least a 20 percent match is required by the applicant. A funding requirement targets 30 percent of the funding for motorized trails, 30 percent for non-motorized trails and 40 percent for diversified trail use.

For more information about the Recreational Trails Program, contact the Missouri Department of Natural Resources' Division of State Parks at 573-751-5374 or visit [mostateparks.com/page/55065/outdoor-recreation-grants](http://mostateparks.com/page/55065/outdoor-recreation-grants).

## ShakeOut! 2013



When will the next big earthquake occur? There is no way of knowing, but

geologists and other earthquake experts meet in February to help edu-

cate the public about why earthquakes happen, how people should prepare and what one should do if they experience an earthquake.

Join the department and millions of people Thursday, Feb. 7 at 10:15 a.m. for the Great Central U.S. ShakeOut. Everyone is encouraged to register to participate in the drill, which will highlight "Drop, Cover and Hold On" and protective actions people should take when experiencing an earthquake.

The Missouri Bootheel experiences an average of more than 200 measured earthquakes per year – about 20 per month. An earthquake with a magnitude 2.0 is about the level at which one typically can be felt by humans. A total of 68 earthquakes that ranged between magnitude 2.0 and magnitude 3.9 shook southeast Missouri in 2009-2011. Nearly 900 people in 21 states reported shaking in a magnitude 3.9 earthquake recorded Tuesday, Feb. 21, 2012 near Sikeston.

More than 200 years ago, a series of three to five major earthquakes (M7.0 or larger earthquakes) occurred near the southeast Missouri town of New Madrid. The quakes occurred during a two-month period between Dec. 16, 1811 and Feb. 7, 1812.

U.S. Geological Survey data show a 90 percent chance for a magnitude 6.0 or greater earthquake by the year 2040. This would impact a four- to eight-state region. Visit [dnr.mo.gov/geology/geosrv/geores/geohazhp.htm](http://dnr.mo.gov/geology/geosrv/geores/geohazhp.htm) for more information about public awareness events planned for February.

## Cleanup Grant Issued for Laclede Sinkhole

The Missouri Department of Natural Resources has awarded \$10,000 to the Meramec Regional Planning Commission for the cleanup of a Laclede County sinkhole that has been linked to pollution of one of the state's largest springs.

The department awarded the grant to the planning commission, which is working in partnership with the Missouri Cave and Karst Conservancy, to

cleanup Goodwin Sinkhole and Goodwin Pit Cave in Laclede County. The effort is known formally as the Partnership for Cleaner Water through Illegal Dump Cleanup, Education and Community Involvement Project.

The sinkhole been used as an illegal dumping site for trash, tires, appliances, furniture, construction waste, used motor oil, dead animals and other unwanted items for decades. The site has been confirmed as a source of pollution in the region.

The department conducted a dye trace of the Goodwin Sinkholes and verified that it flows underground and emerges 10 miles away at Ha Ha Tonka Spring. The spring is the 11th largest spring in the Ozarks, discharging 50 million gallons per day and is part of Ha Ha Tonka State Park. The goal of the project is to reduce the effects of pollution from the sinkhole on water quality in the spring.

The Meramec Regional Planning Commission will provide a match contribution of \$7,426 over the life of the project bringing the total cost to \$17,426. The sponsor expects to complete this project by Aug. 31, 2013.

In addition to the department and the Missouri Cave and Karst Conservancy, partners in this collaborative effort include the Laclede County Commission and the Laclede County Road and Bridge Department.

The U.S. Environmental Protection Agency, Region 7, has provided partial funding for this project under Section 319 of the Clean Water Act. The Department of Natural Resources administers the grant funds.

## Open House at Edward Clark Museum



In celebration of the Missouri Geological Survey's 160th anniversary,

staff with the Department of Natural Resources' Division of Geology and Land Survey encourages the public to visit the Edward Clark Museum of Missouri Geology during their open





## environmental notes

house, April 22-26. Exhibits and presentations will illustrate the diversity of projects in which Missouri Geological Survey employees are engaged.

The museum boasts impressive displays of minerals, rocks, fossils, a real mammoth tusk, historic items used throughout the long history of the division, and more.

The Missouri Geological Survey staff continue to be leaders in research on Missouri geology, earthquakes, geologic mapping, environmental geology, mineral and energy resources and other functions that benefit Missourians.

This is a good time for you and your friends or family to take advantage of this unique opportunity to interact with staff, enjoy hands-on exhibits and gain a greater appreciation of our connection to the natural systems of our dynamic planet.

The Open House is "kid friendly" and admission to the museum is always free. Located at 111 Fairgrounds Road, Rolla, museum hours are 8 a.m. to 5 p.m. Visit [dnr.mo.gov/geology/](http://dnr.mo.gov/geology/) to learn more about the open house and the important role staff with the Missouri Geological Survey play in the protection and wise use of our state's natural resources.

### Pollution Reduction Grant for Table Rock Lake

The Missouri Department of Natural Resources has awarded \$10,000 to the Upper White River Basin Foundation for a program aimed at reducing the amount of pollution entering Table Rock Lake via stormwater runoff from marina operations.



The Upper White River Basin Foundation will create a pilot program, to be known as the Missouri Clean Marina-Upper White River Basin Pilot Program. This concept will be locally led within the Upper White River Basin watershed with emphasis on protecting Table Rock Lake. The program will give local marina owners the opportu-



### Down in the Dumps Risks of illegal dumping run deep

The illegal dumping of solid and hazardous waste is a pesky problem in Missouri, given the rural nature of our state. It is often easy to conceal a hidden dump site in a remote area where it may never be discovered. Illegal dumping carries many risks, not only to the environment, but to human health.

Dumping poses obvious hazards such as fires, drainage issues and groundwater pollution. Burning tires are especially dangerous because of toxic smoke and groundwater contamination. Dumping also can impact drainage and cause flooding when waste blocks culverts, creeks and other outlets. Water that accumulates in dump sites contains hazardous chemicals that can seep into drinking water supplies, as well as natural waterways, harming wildlife and humans.

In addition to the physical hazards, dumping poses biological risks such as disease. Decomposing garbage attracts rodents such as deer mice which are known to carry Hantavirus and plague, diseases that can be spread to humans. Scrap tires in dump sites accumulate water, a prime breeding ground for mosquitoes, which can carry diseases such as encephalitis, dengue fever and West Nile Virus. Waste can easily be disposed of properly in an authorized landfill, transfer station or recycling center, so practical and legal options are in place.

Large items such as furniture and old appliances can be donated if still in working order. Otherwise, contact your local trash service for details on how to dispose of these items properly. Old tires can be returned to a tire retailer or recycling center and used car batteries can be taken to the nearest car battery or auto parts retailer for recycling or disposal. When in doubt about an item, contact a Department of Natural Resources regional office for information on how to dispose of your waste properly.

If you see someone dumping, do not confront them. Be sure to record a description of the people involved, any vehicles, including make, model, color and license plate number, the location of the dump site, what was dumped, date and time of the sighting and any other identifying information. Report the incident immediately to a DNR regional office. In addition, do not pick through trash or disturb the dump, and keep children away from the area.

For more information on the dangers of illegal dumping, visit the Environmental Protection Agency's website on wastes at [epa.gov/osw](http://epa.gov/osw). If you need to contact a DNR regional office about dumping in your area, call 800-361-4827 or visit [dnr.mo.gov/regions/regions.htm](http://dnr.mo.gov/regions/regions.htm). To report an environmental problem online, go to [dnr.mo.gov/concern.htm](http://dnr.mo.gov/concern.htm).

Source: MoDNR and U.S. EPA

nity to take part in a voluntary program to reduce their impact on water quality while educating boaters and the community of their stewardship efforts. The goal is to enroll at least ten marinas and use this pilot program as a catalyst in making the Missouri

Clean Marina Program a successful statewide initiative.

The Upper White River Basin Foundation will provide a match contribution of \$6,700 over the life of the project bringing the total cost to \$16,700. The foundation expects to complete

this project by Dec. 31. Partners in this collaborative effort include the U.S. Army Corps of Engineers–Table Rock Lake, Table Rock Lake Marina Association, Ozarks River Heritage Foundation and the Missouri Stream Team Watershed Coalition.

The U.S. Environmental Protection Agency, Region 7, has provided partial funding for this project under Section 319 of the Clean Water Act. DNR's Water Protection Program will admin-

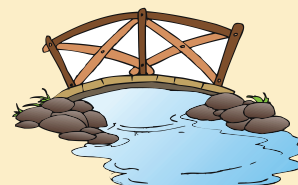
ister the grant funds. The department is committed to working closely with communities and businesses to assist with funding efforts that improve water quality in Missouri.

## Keifer Creek Watershed Receives Grant

The Missouri Department of Natural Resources has awarded \$30,000 to the Missouri Coalition for the Environ-

ment to develop a watershed protection plan for a creek that runs through a state park in the St. Louis area.

The funds will be used to develop a nine-element watershed management plan to assess pollution issues from stormwater runoff in the Keifer Creek watershed, and develop and imple-



Thanks for the focus on Energy Efficiency in the Fall 2012 edition of *Missouri Resources*! I was excited to read that DNR's Division of Energy was able to obtain funding to promote energy conservation at state-owned buildings. More efficient state facilities mean lower costs for taxpayers, cleaner air for all Missourians, and local jobs. The column on what each of us can do in our own house to be energy efficient this winter was also helpful. I implemented several of these ideas in my own home about two years ago – I added insulation to the attic, installed a programmable thermostat, and caulked around window frames and doors. The result – my gas bill went down by 30 percent!

As the Chapter Director for the Missouri Sierra Club, I know that thousands of Missourians are committed to promoting energy efficiency as the cheapest and cleanest form of energy available. Thanks for spreading the word!

John Hickey  
Webster Groves

I am sure this is old stuff to you who study geology, but several years ago when Highway 13 (now Route 123) went through Fairplay, I saw a cut in the highway that is a conglomerate. It has rounded creek gravel in it and is still there. I ran across this while working for MoDOT, where I was employed for 40 years.

I enjoy *Missouri Resources* magazine.

George DeWoody  
Springfield

Editor's Note – Author Pat Mulvany responds:

*The interesting sedimentary layer you describe is known to geologists as "Graydon Conglomerate" or "basal Pennsylvanian Conglomerate." It is known to occur in scattered areas in Cedar, St. Clair, Polk, Green and Callaway counties. It was deposited in incised channels during the Pennsylvanian Subperiod of geologic time, about 310 million years ago.*



Pat Mulvany's article on Ancient Life in Kansas City had some fascinating stuff. One general area I'm curious about: Missouri has lots of rolling hills and when I look at the road cuts, they reveal that the same layers are in nearby hills, but interrupted by valleys. The layers don't seem to have weathering between them. Does that mean that those layer sets were laid down quickly?

For fossils in general, and especially the soft parts that you mention, is sudden burial by flooding required to avoid decay, or is there some other known method? I've seen pictures of some recent fossilized artifacts (sack of flour, etc.) in spring water locations in other states and nations. Have you run across examples of modern fossilized artifacts in Missouri?

Keep digging, I'd like to see more local fossils in *Missouri Resources*. I know marine is the most common, but dinosaurs and mammals would be fascinating, too, for me, and I assume, many others.

Thanks,  
Gary Winkler  
St. Louis

Editor's Note – Author Pat Mulvany responds:

*Thank you for your interesting observations. The geology in Missouri is diverse and many factors can lead to the different color, texture and appearance of rock outcroppings. The preservation of soft body parts in the natural environment can occur in one of two ways. Desiccation in an arid region will do it. Rapid burial in water and sediment that is depleted in oxygen will do it, too. In either case, scavengers must be absent.*

Letters intended for publication should be addressed to "Letters," *Missouri Resources*, PO Box 176, Jefferson City, MO 65102-0176 or faxed to (573) 522-6262, attention: "Letters." Please include your name, address and daytime phone number. Space may require us to edit your letter. You also can email *Missouri Resources* staff at [moresdnr@dnr.mo.gov](mailto:moresdnr@dnr.mo.gov).



ment best management practices to resolve the issues. Best management practice designs and improvements from this plan, known as the Keifer Creek Watershed Management Plan, may be incorporated into criteria manuals and future local policies and ordinances addressing urban water quality within the watershed.

Keifer Creek flows through the heart of Castlewood State Park, and is a tributary to the Meramec River.

The Missouri Coalition for the Environment will provide a match contribution of \$20,004 over the life of the project, bringing the total cost to \$50,004. The coalition expects to complete this project by November 2014.

Partners in this collaborative effort include the Missouri Department of Conservation, the Metropolitan St. Louis Sewer District, the East-West Gateway Council of Governments, St. Louis University, Washington University, Webster University, local municipalities and volunteer citizens.

The U.S. Environmental Protection Agency, Region 7, has provided partial funding for this project under Section 319 of the Clean Water Act. DNR will administer the grant funds.

## Energy Forum Held at University of Missouri

Llona Weiss, director of DNR's Division of Energy, attended the Economics of Power Generation Forum on Nov. 15, 2012, on the University of Missouri-Columbia campus. The event, one of the Christopher S. "Kit" Bond Lecture Series, focused on the economics and environmental impact of a variety of energy sources, the policy and politics surrounding these issues and why affordable energy is important to Missouri's economy.

Dr. Frank Clemente, professor emeritus of social science and energy policy at Penn State University, was the featured guest lecturer. Dr.



Clemente specializes in the socioeconomic impact of energy policies, especially issues relating to electricity generation, reliability and cost.

Dr. Clemente's lecture was followed by a forum and panel discussion. Daniel Beck, supervisor of engineering analysis in the energy unit of the Missouri Public Service Commission,

served as the forum's keynote speaker. A panel discussion, which featured Jared Wilmes, MFA Biomass, Dr. Cerry Klein, sustainable energy facilitator for Mizzou Advantage and Floyd Gilzow, director of member relations and public affairs for the Missouri Public Utility Alliance, addressed issues such as universities' roles in energy solutions

## Stream Team Notebook

### Ambassador Award is Music to Volunteer's Ears

John Rothgeb, Stream Team 2958, was this year's recipient of the Ambassador Award for Volunteer Water Quality Monitoring. The Ambassador Award is given yearly to Stream Team and VWQM Volunteers who exemplify the Stream Team spirit. Now living just outside Caulfield, Mo., with his seven dogs, Rothgeb is an active member of the Ozark Chapter of Missouri Master Naturalists and a Level 3 Volunteer Water Quality Monitor.



John Rothgeb and Ozark County fourth-graders enjoy a spring field trip.

George Sims photo

In his "previous life," Rothgeb completed his undergraduate studies at Northwestern University and later went on to be one of the first two to earn a doctorate in Music Theory from Yale University. He served on the faculty of Florida State, University of Texas-Austin and State University of New York-Binghamton. Recently, he has been involved in translating several works of music theory from German for publication.

Rothgeb has worked with the Bryant Creek Assessment Project which annually monitors every mile of Bryant Creek to provide an overall picture of the stream's health. In addition to monitoring his own segments, Rothgeb has pitched in and monitored other stretches of the creek, as well. As if that does not keep him busy enough, Rothgeb has joined his friends, George Sims and Tom Arth, in giving presentations to 18 groups of Ozark County sixth-graders and twelve groups of fourth-graders in the past year. They covered subjects such as water chemistry and aquatic macroinvertebrates. All this is in addition to monitoring his personal sites on Bridges Creek, Bennett's Bayou and the North Fork River. It is hard to imagine anyone more deserving of the VWQM Ambassador Award. As one friend said, "John is just a good guy to run the river with."

The Stream Team Ambassador Award regional winners were: Southwest and Ozarks Region – Billy Backues, Stream Team 4193; Northwest Region – Stuart Caswell, Stream Team 4503; and St. Louis and Southeast regions – Sam Allison, Stream Team 4169. These awards are selected for Stream Team efforts other than water quality monitoring.



## TIME EXPOSURES

Lovers Leap, an impressive 300-foot tall limestone bluff that rises above the city of Hannibal, is one of four such officially named features in Missouri. This photo also depicts railroad box cars going about their business along the banks of the Mississippi River.



Hannibal, the boyhood home of Mark Twain has always been known for its rich railroad history where Twain's father, Judge John Clemens, was one of the original planners of the first railroad to cross the state of Missouri – the Hannibal & St. Joseph Railroad (completed in 1859). The horizontal photo, likely taken atop Cardiff Hill and made famous in Twain's books, looks down on the city's robust railroad operation, complete with a large railcar roundhouse.

According to the Geographic Names Information System [geonames.usgs.gov/domestic], three other similarly named features in Missouri include Lovers Leap in Clark and Howell counties, and Lovers Leap Bluff in Camden County. These photos were taken by geologists with the Missouri Geological Survey who were doing fieldwork in the area, circa 1915.



Send your photo to "Time Exposures," c/o Missouri Resources, PO Box 176, Jefferson City, MO 65102-0176. Original photos will be returned via insured mail. Pre-1970 environmental and natural resource photos from Missouri will be considered. Please try to include the date and location of the picture, a brief description and any related historic details that might be of interest to our readers.

department staff and stakeholders, and developed the following revised mission statement that better reflects the division's current role: "The Missouri Department of Natural Resources' Division of Energy assists, educates and encourages Missourians to advance the efficient use of diverse energy resources to provide for a healthier environment and to achieve greater energy security for future generations."

### Missouri Trails Book Now Available

People who love trails or those wanting to experience trails for the first time will find an outstanding resource in a new publication entitled *Trails of Missouri State Parks*.

This 400+-page full-color book contains information on more than 230 trails in 58 Missouri state parks and historic sites.

The comprehensive guide is filled with detailed information about each trail, including descriptions, maps and GPS coordinates. The book includes information on the different types of trails available, including hiking, bicycling (including those suitable for mountain biking), equestrian, backpacking and ATV/ORV, as well as which trails are accessible to people with disabilities. Additional facts about the state park system, trail safety and trail etiquette will ensure that everyone has a positive and fun trail experience.

Published by Missouri State Parks, the book can be purchased by visiting [mostateparks.com/shop/TrailBook.htm](http://mostateparks.com/shop/TrailBook.htm) or by calling 800-334-6946.



and the environmental impacts of energy generation to the state.

### Division of Energy Mission Revised

The Department of Natural Resources' Division of Energy convened an Energy Stakeholder Process in late 2011 and early 2012 to discuss the state's future energy issues, and more specifically, the division's role. As a result of this process, the Cadmus Team

produced a March 2012 report that presented several recommendations. The diverse group of stakeholders focused on the role of the division relating to Missouri's energy issues.

One of the recommendations resulting from the process was for the division to modify its mission statement. In response, the Division of Energy convened several planning and drafting meetings, incorporated input from the Energy Stakeholder Process,

For news releases on the Web, visit [dnr.mo.gov/newsrel/](http://dnr.mo.gov/newsrel/).

For a complete listing of the department's upcoming meetings, hearings and events, visit the department's online calendar at [dnr.mo.gov/calendar/search.do](http://dnr.mo.gov/calendar/search.do).

Looking for a job in natural resources? Go to [dnr.mo.gov/hr/](http://dnr.mo.gov/hr/).



Resource Honor Roll **Loring Bullard**

**L**oring Bullard, the recently retired CEO and executive director of the Watershed Committee of the Ozarks, analyzed his first water samples at the age of 10 in his hometown of Springfield. That first microscope sparked a distinguished career in water quality protection that endures today, even after retirement.

"I was amazed at all that life packed into a few drops of water," Bullard said.

Bullard earned his Bachelor of Science in biology from Central Missouri State in 1974 and was hired by the Springfield/Greene County Health Department. He retired 13 years later as Supervisor of Environmental Health. After more than a decade on the government side of environmental protection, he accepted a new challenge as executive director of the Watershed Committee of the Ozarks. During his 23 years with the WCO, Bullard helped secure more than \$3.2 million in funding for watershed projects. He says educational efforts, such as best management practices on farms, are critical in the long run. He knows watershed plans are important, but says someone in authority has to be responsible to make sure plans are implemented.

"No one likes more regulations," he said. "But in many cases they have turned out to be the most effective tools."

Bullard's interactions with other states has confirmed that Missouri's efforts are held in high regard. Still, he admits to periodic frustration

with a lack of progress on local levels. Yet he tempers this with the acknowledgment that he sees Missouri watersheds at an up close and personal level.

"I always said, 'the closer you stand to the mirror, the more blemishes you see.'"

Bullard is an accomplished author who has written several stories from various perspectives about the waters of our state. An expanded book version of an article published in *Missouri Resources* in 2002 was entitled, *Healing Waters: Missouri's Historical Mineral Springs and Spas*. Published in 2004, it made Amazon.com's best seller list, detailing at least 120 mineral springs in Missouri.

Bullard's still writing and also teaches environmental science at Drury University in Springfield. He continues to seek public support for dealing with pervasive, difficult to quantify non-point source pollution.

"That's still our biggest remaining challenge, he said. "I'm hopeful the Our Missouri Waters initiative will bring the watershed approach into more prominence in our state."



Carol Bullard photo

**Loring Bullard at Quetico Provincial Park in Ontario, Can.**

## Rock Matters

### Sandstone

Look through the window of your house or your car, or maybe even your water glass and you are probably looking at sand. Actually, you are looking through a product made from a very pure form of silica sand and there is a chance it originated as a part of Missouri geology. DNR photos by Justin Davis

**S**andstone is a sedimentary rock composed of angular or rounded sand grains that are cemented together with silica, clay, iron oxides or calcite. The grains are composed predominantly of the mineral quartz, but any rock or mineral grains of sand size (usually less than 1/16 of an inch in diameter) may be present. The grains may sparkle from reflections of light from their crystal faces, or they may have dull, frosted surfaces. Sandstones cemented with silica, calcite or clay are generally white or gray, while those cemented with iron oxide are red, brown or yellow. The cements are usually softer and weaker than the particles they hold, and are the first to break when the rock is scratched or crushed, freeing the harder quartz particles.

Sand has been mined for glass manufacture in Missouri since the Pittsburgh Plate Glass Co. began operating in Jefferson County in the 1870s. This sand is mined from a formation called the St. Peter Sandstone, which is highly pure quartz sandstone. Recently, producers have been putting nearly half a million tons of this Missouri-based industrial mineral into the market each year for that purpose. Other commercial uses of sandstone include building stone, flagstone, furnace linings and common

aggregate. In western Missouri, various layers of Pennsylvanian sandstones serve as reservoirs for oil and natural gas. Learn more at [dnr.mo.gov/geology/geosrv/imac/stpetersandstone.htm](http://dnr.mo.gov/geology/geosrv/imac/stpetersandstone.htm).



**(Top) Magnified sandstone grains.**

**(Above) Sandstone outcrop and mine.**

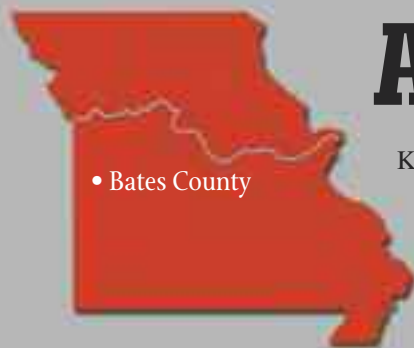
resources to explore

# Battle of Island Mound

New state historic site commemorates 1862 battle

by Tom Uhlenbrock

Harper's Weekly, March 14, 1863



**A** plot of rolling prairie near the Kansas border is Missouri's newest state park facility, serving as a monument to the bravery of the African-American Union soldiers who fought a small but important Civil War battle there.

The 240 soldiers, most of them escaped slaves, were members of the First Kansas Colored Volunteer Infantry and took part in what became known as the Battle of Island Mound, marking the first time that black troops engaged in combat in the Civil War.

Alison Dubbert, a historian with Missouri State Parks, said news of the battle, a Union victory, made headlines as far away as New York City. An illustration of the fight appeared in Harper's Weekly in 1863.



Tom Gregory portrays a soldier of the 10th Cavalry. The 10th Cavalry was formed after the Civil War, a segregated regiment organized at Fort Leavenworth, Kan., in 1867. Composed of black enlisted men, the group moved to Fort Riley, Kan., later in 1867. This was one of the original "Buffalo Soldier" regiments and served in the Indian Wars and Spanish-American War in Cuba.

"At the time, there was a national discussion about whether African-Americans could be soldiers, and stand up to white men and fight," Dubbert said. "A lot of people figured they would throw their guns down and run away. This historic battle put that to rest."

The Battle of Island Mound State Historic Site, amid the soybean fields in a rural area west of Butler, was dedicated Oct. 27, 2012, the 150th anniversary of the day the First Kansas Colored Volunteer Infantry marched into the state of Missouri. The event included living history activities and military demonstrations.

A kiosk at the site has interpretative panels that explain what happened, and why the battle was so significant. Here is a summary:

Bates County, in far west-central Missouri, had become a haven for guerrillas and Confederate recruiters. One of their haunts was a marshy area on the Marais-des-Cygnés River known as Hog Island. On Oct. 27, 1862, the First Kansas Colored Volunteer Infantry was sent to clear the insurgents out.

The black troops commandeered a farmstead owned by Southern sympathizers, Enoch and Christiana Toothman. They fortified the yard with fence rails and called it "Fort Africa."

The black troops eventually were lured from their camp and into a rebel trap. The two sides met on a low hill known as Island Mound. Outnumbered, the black soldiers faced a foe on horseback armed with shotguns, pistols and sabers. They fought back, using bayonets and the butts of their rifles.

"Fierce hand-to-hand fighting ensued," Dubbert said. "The black soldiers received praise from both sides on how hard they fought. If they gave up, they would either be killed on the spot or taken back to slavery. They were fighting for their lives, and their freedom."

Lt. Richard Hinton, a white officer with the First Kansas Colored Volunteer Infantry, wrote of the battle: "This is what we have done. We have demonstrated that the Negro is anxious to serve his country, himself and race; that he can be drilled and made effective as a soldier; and that he will fight as well as any other set of men."



DNR photo by Scott Myers

## The History of the First Kansas Colored Volunteer Infantry

From the time recruitment opened in August 1862 until they were mustered out of service on Oct. 1, 1865, the First Kansas Colored Volunteer Infantry saw extensive action. They fought in 16 battles and numerous small skirmishes.

Recruitment of the First Kansas Colored Infantry began	
Island Mound, Bates County, Mo.	August 1862
First Kansas mustered into Federal service	Oct. 29, 1862
Sherwood, Mo.	Jan. 13, 1863
Cabin Creek, Cherokee Nation	May 5 and 18, 1863
Honey Springs, Indian Territory	July 1-2, 1863
Lawrence, Kan.	July 17, 1863
Horse-Head Creek, Ark.	July 27, 1863
Roseville Creek, Ark.	Feb. 17, 1864
Prairie D'Ann, Ark.	March 20, 1864
Poison Springs, Ark.	April 13, 1864
Jenkins' Ferry, Ark.	April 18, 1864
Flat Rock Creek, Indian Territory	April 30, 1864
Fort Gibson, Cherokee Nation	Sept. 16, 1864
Timber Creek, Cherokee Nation	Sept. 16-18, 1864
Redesignated the 79 <sup>th</sup> United States Colored Infantry	Nov. 19, 1864
Joy's Ford, Ark.	Dec. 13, 1864
Clarksville, Ark.	Jan. 8, 1865
Roseville Creek, Ark.	Jan. 18, 1865
79 <sup>th</sup> USCI mustered out of service	March 20, 1865
	Oct. 1, 1865

Larry Limpus prepares a sheepskin during one of several 19th century skills demonstrations at the Battle of Island Mound State Historic Site dedication.

DNR photo by Scott Myers



## Smoke on the Prairie

To reach Island Mound State Historic site, take Highway 52 west from Butler, and go south on Route K to the park signs. The 40-acre site has a circular gravel path that leads around a replanted swath of prairie, with three smaller interpretative panels along the walk.

Scattered sunflowers were blooming on the prairie on a fall morning when John Cunning led a walk on the path, and explained the battle. Cunning is program director for resource management and interpretation for Missouri State Parks.

“In that corner where the stand of trees is, we have evidence that indicates there was a building there – it might have been the Toothman house,” Cunning said. “What we have is the site of their bivouac, their headquarters, for three days.”

Cunning explained that the guerrillas used the prairie and the rolling landscape in the battle. They set fire to the prairie as a smokescreen, and used Island Mound to

***“Here, in uniforms issued on behalf of a country that had not yet emancipated them, they revealed courage and tenacity under fire.”***

- Dedication plaque, Battle of Island Mound State Historic Site

DNR photo by Scott Myers



Sara Parker Pauley, Missouri Department of Natural Resources director, and Bill Bryan, Missouri State Parks director, lead a group of dignitaries and visitors to officially open Battle of Island Mound State Historic Site on Oct. 27, 2012.



hide their troop movements. Hog Island has disappeared over time, as the river changed its course.

“When the First Kansas arrived on the 27th, there was a notation that horsemen were on the ridge taking potshots at the house,” Cunning said. “Very likely, it was that ridge.”

## Understanding History

On Oct. 29, 1862, a small party of Kansans was about a mile from Fort Africa when some 130 rebel horsemen emerged from the woods. The two groups clashed on the southern slope of Island Mound. Two units of African-American troops arrived in armed support.

“They ended up with three different units firing on the horsemen, and that’s what drove the guerrillas back onto Hog Island,” Cunning said. “When reinforcements arrived from Kansas the next day, they found the guerrillas and recruiters had abandoned the island.”

Eight members of the First Kansas infantry were killed and 11 wounded. Southern losses are not known, but were thought to be about the same.

Cunning noted that the 1989 movie “Glory” received praise for telling the story of the 54th Massachusetts Volunteer Infantry, which was billed as the first formal

DNR photo by Scott Myers



(Above) During the dedication at the new historic site, interpretive tents were set up along Courage Trail to give visitors insight into the Civil War and the early role of black soldiers. Most of the reenactors were dressed as Buffalo Soldiers, as the First Kansas Infantry Volunteers had few uniforms when they first went to battle.

(Below left) Blacksmith Jim Ridley demonstrates his craft, a critical skill required during extended battles in the field.

(Below right) John Bruce of Kansas City portrayed a soldier of the 10th Cavalry at the historic site dedication. The First Kansas Colored Infantry Volunteers were formed in August 1862 by the State of Kansas before the federal government allowed black recruits into service as combatants. They were brought into the federal army in January 1863.



DNR photos by Scott Myers



(Above) State employees Michael Dyer (left) and Jeff Apperson install the sign at Missouri State Parks' newest facility, Battle of Island Mound State Historic Site, near Butler in Bates County.

(Right) The memorial plaque commemorating the 1862 battle.  
(Bottom) The site's kiosk serves as a shelter and a source of interpretation with displays about the history of the new state historic site.



unit of the U.S. Army to be made up entirely of African-American men.

The soldiers of the First Kansas Colored Volunteer Infantry were officially mustered into the U.S. Army later, but they still fired the first shots.

"Because of the movie 'Glory,' many people believe that the 54th Massachusetts was the first African-American regiment to face combat in the Civil War, but they weren't," Cunning said. "Part of our goal is to help the visitor understand that history.

"The audience that I expect will visit the site will be people interested in Civil War history and African-American history. There was a surprising amount of press about this fight in 1862, especially considering how small the battle was. We want people to know about it in the 21st century, as well."

For more information, visit [mostateparks.com](http://mostateparks.com).

*Tom Uhlenbrock is a writer for Missouri State Parks, a division of the Missouri Department of Natural Resources.*



# one last word

## ePermitting

Saving time ...  
and the environment

by Larry Archer  
photograph by Scott Myers

A person touring the Wentzville neighborhood of Stone Meadows should not be faulted for not recognizing the important difference between the development's existing residences and those currently under construction.

While there might be differences in construction, the most significant is how the builder, McBride and Sons of Chesterfield, received the required land disturbance permit before beginning construction. The company was the first to be issued a permit under the Missouri Department of Natural Resources ePermitting system. The online system, which went live June 26, 2012, and can be found at [dnr.mo.gov](http://dnr.mo.gov), allows builders like McBride and Sons to receive their permit in a matter of minutes, rather than the weeks previously required.

"We can now apply for a permit in 10 minutes," said Jeremy Roth, general manager of land development for McBride and Sons. "Before, we'd have to go to the website, download an application, fill it out, have a check cut and mail it in.

"It just makes the process a lot smoother," Roth said.

A land disturbance permit, which is the most common department permit, is required for any project that results in the disturbance of one acre of land or more. The permit helps the department ensure that developers are taking the necessary steps to prevent soil erosion from polluting the project's local waterways.

The ePermitting process has all but eliminated traditional paper permit applications. Developing ePermitting, which included reaching out to likely users like Roth, was inspired by feedback the department received from those whose work requires such permits. Department of Natural Resources Director Sara Parker Pauley told



**(Above) Silt fences prevent soil erosion at construction sites from polluting local waterways. A land disturbance permit ensures that developers take the necessary steps, like the installation of a silt fence, to protect the environment.**

members of a clean water stakeholder group on the day the system was unveiled.

"We're in a time where we are intently trying to listen to our stakeholders as to what you see as our greatest needs, and ways that we can provide greater service," Parker Pauley said.

Those who have difficulty with the online process can receive personal assistance at any of the department's five regional offices or the department's headquarters in the Lewis and Clark State Office Building, Jefferson City.

Based on recent history, the department can expect to issue between 800 and 2,400 such permits during any given year, which represents years of time saved over traditional permitting methods. For builders like Roth, that time is money.

"From just a time standpoint, as an applicant, it's huge," he said.

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*Larry Archer is the division information officer for the department's Division of Environmental Quality.*



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OF NATURAL RESOURCES**  
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